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Editorial.

Agriculturists and Land Mortgage Banks. Our readers will be aware of the fact that the indebtedness of our agriculturists and the means of rescuing them from the grip of the money lenders are of late engaging the earnest attention of the Government and the Public and that the development of Land Mortgage Banks is an earnest endeavour in that direction. It may be recalled that these institutions are being started since 1925 with the threefold object of liquidating prior debts, of improving the existing lands, and of helping the agriculturists in the purchase of lands afresh. We however, find from most of the reports of these banks that they are more concerned with the first of these activities, and that the kind of relief afforded, forms only a very small proportion of the total indebtedness in the areas they are aimed to serve. We observe further that even in the case of persons benefited by these loans, there are fairly large arrears in the repayment of instalments especially in the Punjab, Bombay, Mysore and Central Provinces. We are gratified to note that Madras is considered to be far in advance of other Provinces in the matter of working these banks successfully with less defaults and at lowest rate of interest. This should not however be taken to indicate that in Madras there is model for other Provinces to secure unfailing success. The co-operation-mindedness of the debtor-ryot is a *sinequinon* for such success, and this cannot be said to obtain since the Madras agriculturist is as ignorant of co-operative principles as his confreres in other Provinces.

We note, in the October issue of the Indian Co-operative Review in which the present position of these banks has been discussed in a detailed and critical manner, that the proud position of the Madras Bank is due mainly to the great caution exercised in locating the primary banks in the more favoured tracts of the Presidency and to the kind interest taken by the Madras Government in guaranteeing the debenture holders both principal and interest and by declaring them as trustee securities. Very probably the moment the protecting hand of Government is withdrawn, the plight of the Madras Banks would also become more too enviable. Further it would be necessary sooner or later to extend the operations of the bank to tracts where the agriculturist is not quite as sure of his produce as in the deltas and when this comes to be, the authorities of the Land Mortgage Banks will be hard put to retain the present high standard. Surely some arrangement which would induce and at the same time help the agriculturist to pay up his instalments regularly will have to be thought of and put into operation.

We may mention here that the present rot in the working of the Land Mortgage Banks set in with the beginning of the world depression and that the defaults in the payment of instalments are not due to any decline in the productive capacity of the land, but to the fall in prices which has reduced the monetary value of the agriculturist's income, their liabilities with regard to land revenue and repayment of principal and interest of their loans remaining the same. If a method could be devised by which the fluctuations in agricultural prices could not be much felt by the debtors, the repayments of instalments will tend to be more regular and the financing banks as well as the producers of raw materials will be relieved of their periodical anxieties.

It looks to us that commutations of cash obligations into those of the agricultural commodities of the tract on the basis of the then existing prices and treating them in the same way as long term cash loans with regard to the fixing up of instalments to be paid in kind would go a great way to ameliorate the condition of the ryot. We also wish to add that the valuation of the land and their probable income can also be done in terms of the common commodities of the regions concerned. We are fully alive to the fact that this method will bring in more complications in respect of the proper assessment of the grade and class of the material tendered, their storage, and disposal, and will mean the transference of the risk involved in the price fluctuations to the primary banks creating a feeling of insecurity in the minds of debenture holders. We feel sure however that with the joint efforts of competent financiers, actuaries and members of Co-operative and Agricultural Departments, a way could be found to solve these problems to the best satisfaction of all concerned. The Government of the United States of America have recently outlined a scheme of crop insurance against drought and other causes of failure. The most fascinating point in that scheme is that the premia will be collected in kind and stored in Government warehouses as reserves against lean years. A measure somewhat on those lines can be thought of. We may state that the idea is not novel as such grain banks were in existence in Italy, and Spain a few decades ago.

Incidentally it may be pointed out that at the Conference of Land Mortgage Banks of Madras held in last October, a resolution was passed to the effect that sale societies are to be established at the head quarters of primary banks. These societies if organised will prove quite handy for the disposal of the produce stored in the warehouses that will have to be constructed according to the proposed scheme. The new system of payment of loans in kind and storing them will also produce a wholesome effect in the market by steadying and bettering the prices of these commodities. It may further be utilised for the spread of the Departmental strains by insisting on the members to pay the instalments with the produce of specified strains.

A COW BUG (*ANCHON PILOSUM*, WLK.) INJURIOUS TO LEGUMINOUS CROPS IN MALABAR *

BY T. V. RAMAKRISHNA AYYAR,

Retired Govt. Entomologist, Coimbatore, S. India.

Though insects of the bug family *Membracidae*, known popularly by such names as tree hoppers, cowbugs, hornbugs, little devils, etc. are found distributed all over the tropics, hardly any one of them has so far been noted as a plant pest of any appreciable economic importance. Neither Lefroy nor Fletcher in their important publications on Indian insects speak of any of these bugs as plant pests in India. They only refer to one insect of this group *Oxyrachis tarandus*, F. which is commonly noted breeding on *Red gram*, *Acacia arabica* and *Cassia* species and which is never found so far to cause any appreciable damage to their host plants.

During his recent entomological studies in South Malabar, the writer came across a species of this family appearing as a sporadic pest and causing appreciable harm to lab-lab, cowpea and allied leguminous plants. It was noted as rather serious on lablab vines for two seasons in succession in 1935 and 1936. Since there is no record of any such injurious insect from S. India so far, and since the insect is quite different from *Oxyrachis tarandus* F., it is proposed to present this short paper on this insect and on its bionomics noted so far.

Extent and nature of damage. The insects begin to appear in small numbers first on the Cowpea (*Vigna Catjang*) crop early in July after the first monsoon rains. From this crop the insect transfers its activities to lablab during the autumn months and continues till early summer. The external indication is the existence here and there on the vines of oval gall-like enlargements which, when cut, show a regular series of numerous cigar shaped eggs of the bug thrust by a female insect, which give rise to the early generations of the season. In course of time adults and young bugs are noted perching like small spines or thorns on the vines and shoots, and these suck the plant sap. Apart from the damage done to the vines during the process of egg laying by the female puncturing and irritating the vines, the bugs in their different development stages suck up the plant sap from the tender portions and allow the distal parts to fade and gradually die out as in the case of plant lice attack. In bad infestations numerous young vines are found fading and dried up, and several gall like formations are found on the vines, which easily snap when handled. The insect is found in all its stages resting and feeding on the tender shoots and pods, and when disturbed the adult hops off in its characteristic style only to perch on an adjacent shoot.

* Paper read at the Indian Science Congress, 1937.

The insect and its bionomics. Membracid bugs are easily made out and differentiated from other plant bugs by their small size, and particularly by the peculiar structural variations of the prothorax in them. This part of the body, takes different shapes in these bugs forming a short horn like process on either side and into another distinct posterior process; these structures often take curious bizarre shapes in different species and have gained them the name hornbugs on that account. The membracid noted in this connection has been identified as *Anchon pilosum* Wlk. Of the half a dozen species of *Anchon* noted so far from India, this species *A. pilosum* has a wider distribution having been recorded from N. India, Bombay, Ceylon and S. India. From its face to the tip of the wings it measures $3\frac{1}{2}$ to 6 mm. The posterior pronotal process is long and sharply pointed backwards and extends beyond the posterior end of the body. The lateral processes or horns are short and blunt though distinct. Eyes are very small and the wings project beyond the body which is laterally compressed. Head and pronotum, brown testaceous in color; grey pilosity formed all over the body, the post process brown but dark at tip.

As stated before, the eggs are laid in groups, each egg being laid in a puncture made into the growing succulent plant tissue; these eggs hatch in 3 or 4 days into active greenish nymphs. These nymphs have gregarious habits and are often found near the adults and the eggs; they are generally fringed with short spines all over the body surface and feed exactly like the adult bugs on the plant sap. They are neither able to hop nor fly like the adults when disturbed; they either crawl away or drop down. In about two weeks' time, during a normal season, one generation of bugs attains maturity. In this way numerous generations are produced under favourable conditions the pest multiplies and the host plants suffer. So far no natural enemies have been noted. On the other hand the activities of the bug are encouraged and helped by ants as in the case of plant lice. Just like plant lice these bugs also throw out a sweet juice very much sought after by ants. The particular ant found closely associated with this insect is a pale honey colored long legged camponotine ant *Plagiolepes* J. known locally as *Sonan*; it is a fairly common ant found in gardens and households all over Malabar and South Kanara districts. Colonies of these visit the nymphs and adult bugs, tickle them and get the honey dew drops; they also convey the nymphs to secure places on the host plant and tend them like cattle—hence known also as *Cowbugs*. The presence of ants on these leguminous plants often indicate the presence of these membracid bugs also and often give us some clue as to the exact whereabouts of these bugs on the plants.

Control measures. Though when neglected these bugs cause appreciable harm, the pest can be easily controlled with proper

prophylactic and remedial measures. In the early stages, if the adults and the egg galls are hand picked and destroyed, the insect may not assume pest form, but if no attention is paid to it in the early stages, both handpicking and contact washes may be employed with success, even when the bugs are found in numbers. This being the first case of a membracid bug which has shown pest propensities in S. India during his thirty years' experience in S. India, the author has thought it may be interesting to present a short account of such an insect and elicit information and suggestions from economic entomologists in other parts of India.

PRELIMINARY STUDIES IN PLANTAINS GROWN IN MADRAS

BY M. NARASIMHAM, B. Sc. (Ag),

Manager, A. R. S., Samalkot.

Introduction of new varieties cultivated in the different parts of the province was taken up during 1932 at the Agricultural Research Station, Samalkot. The present collection at the station contains most of the important varieties of the Presidency. It was not till that it was possible to put them down on a field scale to study some of their economic characters under normal field conditions. The general trend of variation in plant and bunch characters of some of the varieties was studied during the year, and the data obtained are presented in this paper.

The crop was grown on heavy clay soils with good facilities for irrigation and drainage. Good sword suckers of medium size and of about 3 to 4 months old were planted 10 links apart either way. They were manured at 20 cart loads of cattle manure and 1000 lb. of ammonium sulphate per acre. The fields were irrigated and drained as and when required.

Growth. It may be stated that under Godavari conditions, the crop generally makes its maximum growth during the rainy months of July to November. As the plant puts on more and more leaves, the stem (pseudo stem) gets stouter and stouter and elongated, till all growth practically ceases about two to three weeks before the inflorescence, commonly called the "flower", emerges.

Detailed measurements of the heights and the internodal lengths of four important varieties are recorded in Table I which is self explanatory.

Leaf Production. Varieties vary in the number of leaves they produce in a newly planted field if suckers of almost the same age and size are planted and accorded identical manurial and cultural treatments (Table I). The variation in their different leaf characters is recorded in table II.

Flowering. The rate of opening of the spathes of the "flower" seems to be also a varietal character though largely influenced by weather conditions. Varieties which generally produce smaller number of hands per bunch as the White Chakkerakeli and Bontha, open at the rate of one spathe per day while those which produce a larger number like Karpura Chakkerakeli open at the rate of two or even three. Opening of the spathes covering the staminate flowers also follows the same sequence. Opening is delayed or sometimes does not happen on cloudy and cool days; but if the following day happens to be sunny, the number that open will be more than usual, compensating for the previous day's poor opening.

Spathes commence to separate themselves from the "Flower" proper from about 4 P. M. and completely open out the flowers by about 10 P. M. ordinarily. Varieties vary to some extent in this respect. The pistillate flowers seem to be receptive by this time. Dehiscence of anthers takes place from 6 to 9 P. M., in *Eumusa* and *Musa textalis*, by almost midnight in Peivazhai, and about 2 to 4 A. M. in the West Indian.

If the staminate group of flowers of a plant, is allowed to remain on the plant itself, it continues the process of opening its spathes one after another, till the whole "Flower", exhausts itself. In certain cases the "Flower" continues to open its spathes even after the fruits at the top of the bunch get ripe, while in others the "Flower" exhausts itself before the fruits on the bunch ripen. By allowing the flower to remain on the plant after all the pistillate flowers are released, there seems to be a slight delay in the maturity of the bunch and disparity in the sizes of fruits of the top and bottom hands of the bunch. In varieties like Karpura Chakkerakeli and Bontha Bathusa, if the "Flower" is allowed to remain on the plant after all the fertile hands are released, they at times produce a set of hands with pistillate flowers alternated by few hands with staminate flowers. This seems to be merely an abnormality which only certain varieties exhibit.

Maturation of the bunch. The time taken by a plantain bunch to mature, i. e. the interval between the date of flowering and commencement of ripening of the bunch on the plant, seems to be a varietal character (vide table III). It is however highly elastic, depending on the season following flowering, and the irrigation facilities accorded to it at that stage. The interval gets reduced by more than a month when bunching takes place in February instead of October, in spite of the existence of normal irrigation facilities, probably because of the prevalence of bright warm long days during the maturation period of the bunch thrown out in February. Restricted irrigation at this stage has been found to hasten maturity. It is interesting to note that it is not always the long duration varieties that take a longer time to mature their bunches. Flat sided fruit varieties in general seem to take a much longer time to mature than

the round fruited ones. It therefore seems more useful to note the date of harvest than that of flowering in manurial or cultural experiments on plantain as we are primarily concerned with the time taken for the maturation of the bunch. If this is done, bunches have to be kept on the plant till one or two fruits ripen, to have accurate data.

Fruit. Varieties vary widely in the number of hands per bunch and in weight per fruit, and they respond within limits to varied conditions of plant growth. Data in table IV give an idea of the characters of the bunch for some of the varieties studied.

Number of fruits per hand seems to be a varietal character and the variation in it is practically negligible under average conditions of growth. But under extreme fertility conditions, the number appreciably increases or decreases. In heavier bunches it is only the first three hands that show considerable increase in the number of fruits per hand with a large coefficient of variability while all the other hands excepting the last one or two represent the modal class. It is also the early formed hands in the bunch that record higher weight per fruit (table V).

Ripening of the fruit. The general trend of ripening and rotting and the loss in weight of the bunch during the process, as observed in April, in a group of White Chakkerakeli and Karpura Chakkerakeli bunches are brought out by the data in table VI. Bunches with one or two ripe fruits while on the plant were harvested for purposes of this study.

Under aerated and cool conditions, a fully mature Karpura Chakkerakeli-bunch takes about four days and a White Chakkerakeli bunch takes about five days to completely ripen (i.e. turning yellow). Rotting commences 2, 3 and 4 days respectively in the two varieties after the fruits turn yellow. It therefore shows how White Chakkerakeli is unsuitable for distant transport and marketing.

The relative times taken by a bunch with hands intact and that cut into hands, for ripening and rotting is brought out in the table VI.

It is clear that ripening and rotting are hastened by about 1 to 1½ days in the case of bunches cut into hands.

Seeding in plantain. Plantain fruiting is generally parthenocarpic in nature. Excepting a few wild seeded varieties, none of the cultivated ones produce seed normally, though some of these are however capable of doing so, if a wild seeded variety is in the neighbourhood.

To determine as to which of the commonly cultivated varieties are good female parents for the evolution of new varieties, elaborate crossing work was taken up using primarily White Chakkerakeli, Karpura Chakkerakeli, Mauritius and Bontha as female parents and *Eumusa*, *Musa textilis*, West Indian and *Sapota arati* (Peivazai) as male parents. Mauritius and the White Chakkerakeli refused to set seed

while the other two did so when crossed with *Eumusa* and *Musa textalis*. In addition West Indian induced seeding in Karpura Chakkera-keli and Sapota Bontha. Neivannan was also found to seed freely as it happened to be in the neighbourhood of *Musa textalis* in flower.

The seeds were sown as per 'Dr. Cheesman's method', but all of them failed to sprout. This may either be due to the incompatibility of the parents or the seed under local conditions may require more resting period. The local "Ginjala arati", however, readily sprouted when the seed was sown immediately after the fruit became ripe.

Table No. 1.

*Composition of the Pseudo-stem of plantain after bunching.**(Mean of measurements in 10 plants of each variety).*

Serial Number.	Variety.	Length of internodes in inches (numbering from the top).										Average total length of the stem up to the junction of the flag leaf.	Average length of stalk of the Bunch.	Average length of bunch proper.	Average number of green leaf bases around the stem at the time of bunching.	Average total number of leaves per plant.
		Length of internodes in inches (numbering from the top).														
		1	2	3	4	5	6	7	8	9	10					
1	Karpura chekkekeli	29.3	32.22	19.88	8.90	4.75	3.60	2.04	1.64	1.25	...	99.65	23.78	23.56.	20.00	27
2.	White chekkekeli	19.12	26.00	23.57	14.85	7.73	3.70	1.98 ^s	1.19	0.98	0.60	98.91	16.50	11.95	16.8	25
3	Bontha	27.01	37.50	23.42 ^s	14.40	6.16	39.2	2.08	1.25	0.85	1.40	109.3	32.00	16.20	19.8	29
4	Mauritius	15.00	15.75	10.50	7.00	3.15	1.75	1.15	0.75	0.65	0.45	56.2	...	20.00	16.0	25

Table III.

Time taken by the different varieties to bunch and mature their bunches and the effect of season on the maturation period.

Serial number.	Variety.	No. of plant examined.	Months taken to bunch.		Days taken to mature the bunch.											
			January planting	June planting	Month of flowering.											
					October Fortnight.	November Fortnight.	December Fortnight.	January Fortnight.	February Fortnight.	March Fortnight.						
			I	II	I	II	I	II	I	II	I	II	I	II	I	II
1	White Chekkerkeli	180	10½	8	129-8	115-0	103-5	97-9	94-0	88-5	85-0	82-0	78-3	...	...	...
2	Karpura Chekkerkeli	280	11	8½	127-6	124-2	116-9	114-5	113-0	102-3	98-0	96-5	...	...	...	...
3	Mauritius	40	9½	6½	124-4	124-8	...	109-3	110-3	113-5	...	...	...	...	...	...
4	Bontha	40	10	8	125-9	137-4	128-0	118-0	113-1	114-0	...	...	...	...	...	...
5	Kadali	12	13	...	136-4	...	...	...	...	...	...	89-5	...	...	...	...
6	Vadakkan Kadali	...	11½	10½	...	...	...	111-5	...	...	...	...	...	...	...	...
7	Nendran	...	...	8	...	...	...	106-0	101-7	99-0	...	...	...	...	...	...
8	Kommu Arati	...	10½	8	123-0	112-7	...	...	...	...	...	...	...	...	...	...
9	Namarai	...	9	...	129-0	...	...	...	...	...	...	...	...	...	...	...
10	Sudha	...	10	8	135-0	128-7	...	...	...	106-0	...	...	...	...	...	...
11	Chingan	...	9	...	143-0	...	...	...	...	...	...	...	...	...	...	...
12	Kunnan long	...	11½	...	...	...	...	...	...	...	...	...	...	...	...	...
13	Amrutapam	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...
14	Nadan	...	9½	...	159-5	...	...	...	...	...	...	...	...	...	...	...
15	West Indian	...	10½	7½	...	...	138-0	...	...	...	...	...	...	...	...	...
16	Kapur bale	...	10	7½	...	...	143-0	...	...	...	...	...	...	...	...	...
17	Vannan ordinary	...	10	...	154-0	150-0	...	...	...	...	...	...	...	...	...	...
18	Eradan	...	9	...	168-7	...	...	...	...	...	...	...	...	...	...	...
19	Kundurai Vatan	...	9	7	...	...	...	...	...	...	...	...	...	...	...	...
20	Nei Vannan	...	11	...	171-7	...	...	...	...	...	...	...	...	...	...	...
21	Sirumalai	...	9	7	173-5	...	143-0	...	...	...	...	...	...	...	...	...
22	Yenuga Arati	...	9	7	174-0	...	144-0	138-0	136-5	130-0	...	...	...	...	...	...
23	Vannan Eradan	...	...	8	168-0	...	156-0	143-0	141-0	...	...	...	...	...	...	...
24	Boothi bale	...	...	11½	...	...	...	142-5	129-0	...	...	...	...	...	...	...

Table IV.
Characters of the bunches.

No. of bunches examined	Variety.	No. of hands per bunch.	No. of fruits per hand.		% of stalk to gross Wt. of bunch at the ripe stage.**	% of pulp to fruit at the ripe stage.	Av. Wt. per fruit (in Ozs.)
			Mode.	Mean.			
1	Karpura Chakkarakeli	9-13	16	16.46	85	81.10	283
2	Sudha	9-11	16	15.43	97	78.00	296
3	Vadakkan kadali	12-13	16	16.58	...	86.70	228
4	Kunnan round	8-10	16	16.40	...	...	...
5	Kadali	7-8	16	16.52	7.9	87.80	2.40
6	Surya Kadali	5-6	16	17.40	10.6	86.00	2.11
7	Namarai	5-7	16	15.60	...	70.10	1.10
8	Kunnan long	6-8	14	13.87	9.3	...	...
9	Mauritius	8-9	14	14.50	6.1	75.40	3.99
10	Yenuga arati	8-9	14	13.80	14.7	72.10	3.30
11	Siru malai	7-8	14	13.79	16.9	68.00	3.36
12	Eradan	7-8	14	13.80	12.30	72.00	3.15
13	Kudarai--Valan	7-8	14	14.00	14.1	79.90	3.35
14	Neivannan	8-9	14	14.10	10.5	68.60	4.65
15	Nadan	7-8	14	13.80	7.9	69.50	4.57
16	West Indian	7-8	14	14.00	9.6	73.63	3.33
17	Kapur bale	7-8	14	14.00	10.7	69.80	4.67
18	Vannan eradan	7-8	14	...	...	77.50	2.44
19	White Chakkarakeli	4-5	12	12.71	10.9	67.70	4.43
20	Kommarati	4-6	12	12.92	10.5	69.65	3.30
21	Chingan	6-7	12	12.45	...	77.70	3.78
22	Bontha	4-6	12	11.42	8.1	71.40	7.83
23	Bontha Batheesa	10-15	12	11.75	...	...	...
24	Nendran	4-6	10	9.10	10.7	69.30	7.75
25	Anaikomban	6-8	...	...	5.2	75.80	5.64
26	Nalla Chakkarakeli	4-5	...	...	5.4	76.30	4.85
27	Bendarati	...	...	...	16.1	73.50	1.95
28	Sapota Bontha	...	...	...	14.5	...	2.10
29	Amruta Pani	6-8	...	...	7.5	...	5.70
30	Airamka Poovan	40-45	12	...	8.0	84.90*	2.66*

* Based on the data of fruits in the top 25 hands.

** Stalk cut 18 inches above the top band.

Table V.

Variation in the number and weight of fruits. Variety—Karpura Chekkerakeli.
(Mean 16'46; Mode 16.)

Serial number of hand from the base.	Mean number of fruits.					C. V. in the number of fruits.					Wt. per fruit as a % of mean. Wt. per fruit of the bunch.		Remarks.	
	No. of hands in the bunch.					No. of hands in the bunch.					No. of hands in the bunch.			
	9	10	11	12	13	9	10	11	12	13	11	12		13
	9	10	11	12	13	9	10	11	12	13	11	12		13
1	16:57	19:57	19:94	18:70	17:56	23:78	21:67	20:71	23:84	19:41	109:3	106:6	124:8	
2	17:14	18:75	19:79	20:37	20:11	18:38	17:71	20:00	18:70	21:28	112:3	113:7	116:2	
3	15:52	16:26	16:56	16:85	18:22	4:63	11:93	10:75	11:10	16:74	113:8	117:5	119:4	
4	15:52	15:87	16:34	16:65	16:56	4:63	4:60	5:32	5:22	3:32	111:2	109:6	117:0	
5	15:05	15:95	16:29	16:41	16:00	6:70	4:64	5:03	4:93	2:94	104:5	108:7	109:8	
6	15:00	15:60	15:80	16:43	16:11	6:76	5:51	5:44	5:84	3:41	104:6	112:8	107:7	
7	14:91	15:54	15:72	16:07	16:00	7:71	5:46	5:66	3:73	...	96:7	97:5	96:8	
8	15:10	15:76	16:03	16:25	16:12	11:19	5:52	5:57	5:53	2:33	91:1	95:1	97:5	
9	13:80	15:76	16:15	16:18	16:22	15:50	5:59	6:50	6:18	2:53	90:0	94:4	89:3	
10	...	14:58	15:70	16:20	15:59	...	13:30	7:08	7:22	3:54	79:9	72:4	34:7	
11	...	...	13:75	16:27	15:99	...	...	16:70	6:27	11:19	65:1	54:6	79:4	
12	...	...	...	13:09	15:89	...	...	...	17:79	10:00	...	...	61:1	
13	...	...	...	...	12:44	...	...	...	...	23:95	...	...	53:9	
No. of bunches examined.	21	64	95	84	9									
Per bunch.	15:34	16:57	16:63	16:60	16:42	14:73	15:41	16:12	17:11	16:44	100:0	100:0	100:0	

Table VI.

Progress of ripening and rotting in bunches kept in tact and cut into hands.

(The fruits were kept hung up in shade).

No. of days after harvest.	Hands not separated from the bunch.				Hands separated from the bunch.				Remarks.			
	% of fruit that have ripened.		% of fruit that have commenced to rot.		Wt. of the bunch as a % of its weight at harvest.		% of fruits that have commenced to rot.			Wt. of the hands as a % of their weight at harvest.		
	W. Ch.*	K. Ch.*	W. Ch.	K. Ch.	W. Ch.	K. Ch.	W. Ch.	K. Ch.		W. Ch.	K. Ch.	
0	0.0	0.0	...	...	100.0	100.0	0.0	...	...	100.0	100.0	* W. Ch. = White Chekkerakeli.
1	4.4	9.1	...	...	95.5	95.6	3.9	...	...	94.1	94.9	
2	9.5	37.4	...	...	93.3	93.1	10.0	...	...	90.9	93.7	
3	31.7	81.3	...	...	90.2	89.5	43.9	...	...	84.8	90.3	
4	68.3	98.4	0.9	0.8	86.2	87.1	100.0	...	...	84.1	86.3	* K. Ch. = Karpura Chekkerakeli.
5	94.0	100.0	23.3	2.2	83.3	83.9	...	...	...	81.6	83.3	
6	100.0	...	44.0	11.1	77.1	82.0	...	...	...	78.1	79.3	
7	...	...	68.2	42.1	74.1	...	...	...	...	74.6	...	
8	...	...	95.6	10.0	...	...	...	...	...	...	...
9	...	...	100.0	...	...	...	...	...	...	...	...

NOTES ON THE INCIDENCE OF THE SWARMING CATERPILLAR OF PADDY

By M. C. CHERIAN B. A., B. Sc., D. I. C.

and

K. P. ANANTANARAYANAN B. A. (Hons).

(Madras Agricultural Department)

Introduction. *Spodoptera mauritia*, the swarming caterpillar or the army worm of paddy is long known to be one of the worst insect pests of young paddy in South India. The insect appears in such vast numbers, that it devastates field after field of young growing paddy in incredibly short intervals, marching over fields in regular swarms. In ordinary circumstances, this insect in pest form is known only by the damage done to the crop in large areas simultaneously. The pest usually occurs in crops sown broadcast or in wet nursery. Visible damage is done only when it is in the fairly grown up caterpillar stage and since the pest appears sporadically all over a large tract, its presence is known, and control measures attempted in most cases, only when the caterpillar has finished almost its career of destruction of crop.

It is known that the life cycle is completed in the course of 40 to 50 days, and that under certain conditions the period may be as low as 28 to 30 days. The parent moth lays its eggs in masses on the host plant. The eggs hatch in about 3 to 5 days and the larvae begin to feed. The larval period lasts for about 3 to 5 weeks and the full grown larvae pupate in the soil. In about 10 days adult moths come out. These moths again find out suitable food plants for further infestation, and breeding. The most important point is the insect's instinctive powers to reach suitable breeding places during different parts of the year, and selecting cultivated crops only occasionally.

Distribution of the Pest. In the Madras Presidency, the occurrence of the pest is reported every year in some part or other. In South Malabar, the earliest sown first crop is sometimes subject in May to severe attacks often necessitating a resowing. The insect is found in abundance on hill grasses during October–November, in North Malabar and elsewhere during some years. It is very conspicuous regularly every year during January and February, often in pest scale, in the summer crop grown in the Kole areas of Malabar. Our observations during the past two years have shown that the insect is found even during the other parts of the year, in small numbers in several places at Coimbatore and parts of Malabar and it is thus evident that the insect is present almost throughout the year

in paddy growing areas, ready to appear in pest form under favourable conditions of weather and crop.

Incidence of the Pest. The first condition for the appearance of the pest is the existence of the suitable stage of the crop. The moth generally lays its eggs on tender paddy and only rarely it visits crops over 20 days old for egg-laying. In the course of observations made in the Kole area in Malabar, it has been observed that the moth appears almost immediately after sowing, and start laying eggs when the plants just put forth the needle-like small white shoots. The eggs are laid piece-meal, 15 to 20 in a mass on each plant covering the white shoot, the stem or even the seed itself, unlike in the laboratory where they are found in bigger masses, invariably exceeding 100 in number. The preference shown by the moths to lay their eggs on tender paddy shoots is seen even under laboratory conditions when paddy seedlings of different ages and grasses on which the larvae are known to feed are supplied simultaneously. Apart from the existence of suitable stage of crop for food supply, there appears to be also many other factors influencing the severity of attack under field conditions.

The Conditions of Soil and other Physical Factors. Taking into consideration the infestation in cultivated crop of paddy, there are mainly two periods of outbreaks—one during May in the tracts where usually 'dry sowing' is the rule, and another during January—February in the Kole paddy where 'sowing in puddle' is the practice. While in the former case severe infestations are less frequent and less widespread, in the latter case the infestation is more or less a regular feature every year on a smaller or larger scale. In both these cases, the circumstances which favour the incidence appear to be more or less the same.

From our observations of the pest in the 'dry sowing' areas, it would appear that the pest outbreaks are not of annual occurrence. In some years the first summer rains come in heavy downpours and the fields are flooded. When a dry spell intervenes the water in the fields dries up, or is drained away for facilitating the sowing operations. Army of caterpillars appear in such areas and spread rapidly to all plots in the neighbourhood. The infestation generally stops with the single brood, though sowing is protracted over a longer period and a second crop is also raised during monsoon in the same locality. The occurrence of a host of moths to start a heavy infestation just in time the first crop is started, is a remarkable feature. All that one can perceive, is that a striking change in the atmospheric conditions has been brought about by the first heavy downpour after a long spell of continuous hot weather and the almost immediate exposure of the flooded areas to the hot sun. It would appear that the moths either enlivened from their summer stupour or stimulated to a stronger impulse of breeding activity by the abrupt change in

weather, precociously reach such areas either through tracing the smell emanating from the newly wetted and fast drying soil or rather drifting along the moisture currents that are now set up in the air. The original foci of infestation are invariably lowlying flooded fields from which the growing larvae march in all convenient directions.

The habits of the moths and their occurrence in relation to soil conditions and weather in a typical Kole area in Malabar, viz., the Enamakkal lake, have been studied in greater detail during two successive seasons. The whole lake is first drained off and the seeds are sown in puddle. The soil is soon exposed to the action of the sun. The moths appear soon from the far away hilly tracts in the North and North East. The following characteristic features seem to announce the arrival of moths to the area (1) reduction in the velocity of the winds and their gradual cessation followed by a period of calm and then a change in the direction, (2) hot and sunny weather during day, and humid and sultry condition during nights with cloudy sky, and (3) absence of any continuous and strong breeze. The moths are active during nights only. Now with the change in the atmospheric condition and with the sudden exposure of the soil surface, air movements are initiated. These link the rising mass of air of this region with that of the hill region farther off. Owing to the natural tendency of the moths to move to the region of greater comfort the winged ones get along a more or less continuous belt of moisture laden atmosphere, against the current. Having reached the area, the natural instincts of the moths come into play in the matter of selection of suitable habitat for egg-laying. In fields where the water dries up completely and the soil surface cracks, the egg-masses are rare, while in adjacent lowlying fields where the soil is swampy and the seedlings are more succulent, the moths gather more often for laying eggs.

It is a common experience that though the moths appear all on a sudden in swarms they halt and lay eggs only in certain fields. On close observation it has been noted that they appear in successive batches in the locality whenever the ideal conditions for their egg-laying are prevalent. The most surprising phenomenon is the appearance of broods of adult insects in quick succession though no pupal or larval stages of the insect are noted in the near vicinity. During the year 1935, within an interval of about one month, no less than five batches of moths appeared, and in 1936, during the same period, four such intermittent arrivals were traced in the same locality at very short intervals. It was also noted that when the conditions of weather changed almost all the late sowings in the very same locality escaped fresh egg-layings though moths could be had in numbers due to the emergences from the earliest brood completing their life cycle. A second infestation in the same crop and place did not take place owing to the aging of crop and to the change in the atmospheric

conditions. The larvae completed their life cycle in one locality and the emerging moths marched out instinctively to distant situations suitable for further breeding. From the data so far collected it appears that they are more directed by the prevailing moisture conditions of the atmosphere and the nature of the air movements than anything else. The appearance of large numbers of caterpillars in an area all on a sudden is brought about by the early arrival of a large number of moths to the area during the early stage of the crop.

The Moths' egg-laying activities. Soon after dusk the moths move out of their temporary shelters and distribute themselves over large areas for laying eggs on suitable plants, and hide before morning and remain at rest during the day under cover of dry leaves and cracks in the soil, thatches or other material in the vicinity of plants and bunds. The egg-laying in any one field or fields is completed in the course of three to five days and ordinarily no further egg-laying takes place in the locality, unless in rare cases, by the recurrence of the same soil conditions, fresh brood of moths is attracted to the same plots before the crop is about 3 weeks old. During the period of moth abundance, it has been possible to see the moths active in flying and laying eggs in different portions of the field during nights. One can easily see the moths disturbed from their resting places, while walking slowly through the fields with a 200 candle power light an hour after dusk. The moths take to flight from a distance at the approach of the light and dart with great speed in different directions. The moths in actual egg-laying are, however, not so easily disturbed. During January last, based on previous year's observations, probable affected plots were located and the moths were looked for on certain days as envisaged by the prevailing weather conditions; and this proved the first recorded instance of the operation of egg-laying by this moth in the field on a large scale, having been observed. It is interesting to note that in fields of suitable conditions for laying eggs if the soil conditions appear too swampy for the moths to wade in their efforts to lay eggs piecemeal over several tender plants, they have been found to congregate in small numbers on twigs of plants casually planted on the bunds and on these eggs are laid in very large masses. The newly hatching larvae drop down by means of their silken threads right over the growing seedlings to disperse themselves later on to other plants all round. This observation is suggestive of a further and novel means of destruction of large numbers of moths and egg-masses in a collected form. During the last season, in this manner, no less than 60 to 70 large sized egg-masses were collected and destroyed from each plant twig employed for the purpose.

Summary and Conclusion. From a detailed study of the incidence of the pest (*Spodoptera mauritia*) at the Kole and other areas, it is noticed that the infestation always takes place in newly sown crop and

in plots where there has been no crop previous for a fairly long period. In such cases moths appear all on a sudden, probably attracted by young crop combined with favourable changes in the micro-climate of the locality in question. If the area is sufficiently large and if the sowing is in progress for a longer interval with repetitions of conditions of high humidity and hot sunny weather, successive batches of moths arrive in the locality and all the sowings are serially infested. As a rule, larvae are all of the same age in the same plot or plots and the moths arising out of these larvae do not infest the same crop again. The moths march far before they find suitable material for continuing their brood. In this endeavour, they seem to be guided mostly by certain conditions of weather. In most cases it is fruitless to watch for a second generation in the same crop, as the conditions under which the moths first appear change entirely by the time they complete one life cycle. The actual shifting of the breeding place from one centre to another is guided partly by the insects' instinctive powers and partly by the atmospheric movements. The moths appear to move from one region to another against a drifting current of moisture laden air.

The moth seems to be present even in localities where it is not known to be a serious pest for years together. It is only the paddy crop sown in puddle before the break of the regular monsoon that is likely to suffer. Here again the moths prefer to infest the crop in fields where the swampy conditions of soil persist for a longer period. If on the other hand, the soil dries up quickly and water is let into the fields only after an interval of about 15 to 20 days without any further chance of the land drying up, the infestation is fairly thwarted. A dry sown nursery and the transplanted crop are least attacked. In places of annual recurrence of the pest, resort to transplanting instead of sowing in puddle minimises injury to a great extent. The habit of the moths to lay eggs in masses on twigs planted for trapping offers another easy means of control.

The study so far made is by no means complete. The conditions favourable for their development in plants other than cultivated paddy have to be thoroughly examined, and a climograph showing favourable places for their successful breeding during different parts of the year have to be prepared. Information on such lines will naturally lead us to a better understanding of the causes leading to the moths' sudden invasions to cultivated crops. Observation on this pest are also likely to help us considerably in tackling other allied insects like cutworms in general such as *Agrotis*, *Prodenia*, *Laphygma*, *Chloridea*, etc., which appear sporadically as severe outbreaks among cultivated crops and which seem to respond to changes in weather in much the same way as the swarming caterpillar of paddy.

Research Notes.

Seedling Abnormalities in Cotton.

In the course of recording routine observations on cotton seedlings raised at the Agricultural Research Station, Nandyal, the authors have come across during this season a few cases of morphological abnormalities. As these are of botanical interest and do not seem to have been recorded before, a brief account of them is presented in this note.

The abnormalities observed relate to variation in structure, attachment and number of the cotyledons. They are of four different types.

Case I. A single rotund cotyledon was observed on the top of the hypocotyl, the attachment resembling the peltate condition of the lotus leaf. The fringe was raised all round resulting in a basin like structure. The part of the axis immediately below the attachment was slightly swollen. These were observed in two seedlings of *G. Indicum*. Ten days after sowing the plants did not make any further growth and remained in that condition for about a month when the normal plants attained 6 or 9 inches in height. In one seedling a small sprout appeared from the bulged portion below the attachment. Attempts to induce further growth in the seedlings by special attention proved futile, and as the cotyledons showed signs of drying up the seedlings were pulled out and preserved in formalin.

Case II. In an *Indicum* seedling two cotyledons and the radicle were all the development observed ten days after sowing. The plumule was entirely absent. Failure to grow was not due to insect injury. There was also no mark to indicate that the plumular bud was arrested in growth. It was believed that this defect is congenital and not developmental. The seedlings remained stunted for another week when signs of wilting necessitated pulling it out for preserving in formalin. The cotyledons were thick, succulent, brittle and broader than normal.

Case III was a Cambodia (Co. 2) seedling in which the cotyledons were found fused together from the bases of their stalks to form a sort of open sheath surrounding the stem. The fused cotyledon was shifted to a side, large in size and fan-shaped in out-line. The terminal bud was replaced by a few short branches bearing minute leaves. The plant withered away soon.

Case IV. This was a strange freak in Cambodia seedling where three leaf-like structures with distinct stalks appeared in the cotyledonary node. While two of these had the normal shape the third was smaller in size elliptic-truncate in out-line. The extra growth seemed to be a meristic variation. It is learnt that a similar type of abnormality was once observed in Cambodia by the cotton specialist, Coimbatore and more recently in two plants of *herbaceum* cottons. Seeds from these plants were reported to have given rise to normal plants only. It may be mentioned that Cases I, II and IV are comparatively rare.

A. R. S., Nandyal.

L. Neelakantan.

G. Kondareddy.

A field mite as a household pest in South India.*

As far as the writer is aware there does not occur any previous record of any field mite appearing as a household pest in S. India. Of course there are mites very well known as skin parasites of men and domestic animals like cattle, dogs and birds found all over the world, but the present case appears to be one where what is apparently a field mite was noted to appear in swarms in a house and cause considerable inconvenience to the inmates of the same. In July 1936, the

* Paper read at the Indian Science Congress, 1937.

upper rooms in a new house in R. S. Puram, Coimbatore, were found infested by swarms of a mite crawling along the floor, the walls and even the bedsteads and clothings in them. It was during the night time that these were found more numerous and very active. At night they were even noted crawling over the bodies of sleeping persons and causing very great annoyance. Curiously enough these creatures were not noted to cause anything more than mere mechanical annoyance by crawling over the bodies of persons; they did not prick the skin or cause any irritation or itchings like parasitic mites. Although they were not such, yet the annoyance was sufficient enough to drive the inmates from those rooms.

Attempts to find out what they feed on were not successful. The mites increased to such numbers in the house that the inmates had to vacate the whole wing of these infested rooms for a week and sleep elsewhere. The rooms were fit for occupation only after they were thoroughly washed with crude oil emulsion or phenyle. After an interval of a few months the pest again appeared in the same house though not on such a serious scale as on the first instance. The creatures are very tiny specks of life like very small spiders a greenish brown colour and the adults measure less than a fourth of an inch. It appears as though it was an abnormal migration of the creature from some natural habitat, but attempts to find out the place from where these first came into the house have not so far been successful. The idea of this paper is simply to record such an occurrence not previously known in S. India. As far as the writer can make out the mite appears to belong to the family Tetranychidae in which are included most of the plant feeding forms known as "red spiders" brown mites etc.

The occasional invasion of dwellings by the clover mite (*Bryobia pratensis* G.) has been recorded from the U. S. A., by Miller and in Canada by Gibson and Twinn, but a comparison of the description of the clover mite with the subject of this paper shows that the two do not belong to the same species. It will be interesting to quote Miller's remarks on the peculiar house infesting habit of the clover mite as :

"A habit peculiar to the species is that of entering buildings during the fall. The exact prompting of this migration is still to be determined although heat probably plays a major role. Nymphs and adults will swarm into houses, spend the entire winter there and in the spring pass to the outside. I have observed this on several occasions. There was no food supply in the form of green plants available yet thousands of the mites remained alive throughout the winter of 1923 in a cold basement room."

The exact identity and systematic position of the mite is being studied and it is hoped to record these facts in a future contribution.

Ref. (1) Miller A. E. "An introductory study of the Acarina or mites of Ohio."

(2) A. Gibson. "Household insects and their control" and C. R. Twinn, Book No. 112 new series, pp. 73, Dept. Agr. Ottawa.

T. V. Ramakrishna Ayyar.

Coimbatore, S. India.

Retired Govt. Entomologist.

ABSTRACTS

An Improved Cotton Picker. A much improved, more efficient cotton picker has been recently invented by Rust and Rust in America. It is reported to be capable of doing the work of a hundred pickers.

The new machine strips cotton even from the unopened bolls of the cotton plant. It has also a 'Mechanical gleaner' on it which salvages any dropped cotton. It is more compact so that it can get between narrow rows of cotton plants. (*Science Supplement*, Vol. 84 No. 2186).

V. R.

Prevents Plant Growth on Masonry. According to a Swiss inventor, H. Zimmerli, the growth of plants on walls of masonry can be controlled by adding to the mortar—for example, in case of water reservoirs, beach walls, and the like—substances that prevent the germination and growth of plants. In particular good results are obtained with the addition of three parts of sodium chlorate and two parts of iron sulphate to 100 parts of quartz, sand and mortar. It is especially recommended that some sodium fluoride or colloidal silver also be added. Finally, the hardened plaster is sprayed with a dilute emulsion consisting of boiled linseed oil, wood grease, ground fluorspar, ammonia, and 2 per cent. copper sulphate. This treatment is claimed to be very effective.—(Scientific American, April 1936). (*The Indian Forester*, Vol. LXII, No. 10). K. M. T.

Milk production costs at the Agricultural Research Institute of Northern Ireland by Hale. (*The Journal of Ministry of Agriculture*, Vol. 43, pp. 768).

The prime costs are not comparable with other costing results frequently presented. No value is put on new born calves and no attempt is made to debit various departments of the farm with proportions of overhead costs and rent. Hence the costs will have to be used with caution if they are to be compared with returns. The information contained in the table gives the reasonably accurate direct costs of milk production under practical farming conditions and gives us an idea of the variations the item may be subject to under vicissitudes of farming.

Average prime costs per gallon of milk produced in pence.

	1928-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36
	d.	d.	d.	d.	d.	d.	d.	d.
Depreciation of cows	2.92	0.82	1.60	1.70	1.43	1.46	2.02	1.25
Depreciation and keep of bulls	0.97	0.49	0.34	0.31	0.38	1.41	0.58	0.43
Wages and horse labour	2.91	2.51	2.26	2.00	1.92	1.87	1.98	1.81
Concentrate	4.04	4.58	3.64	3.51	1.94	1.96	2.20	2.20
Coarse fodder	2.54	2.10	1.79	2.27	2.07	2.79	2.24	1.83
Grazing	0.20	0.13	0.91	0.19	0.27	0.28	0.33	0.23
Tuberculin tests	0.70	0.26	0.27	0.27	0.31	0.27	0.30	0.04
Sundries	0.85	0.88	1.21	0.67	0.77	0.65	0.71	0.71
Dairy costs	2.60	1.77	2.15	1.79	2.05	1.85	1.76	1.55
	17.73	13.54	13.45	12.71	11.14	11.54	12.12	10.05
Average No. of gallons of milk per cow	798	798	814	764	624	655	703	729
Lb. of concentrate fed per gallon of milk	3.36	4.27	4.11	4.66	2.74	3.02	3.17	3.33
Average price of concentrates per cwt. £	0-11-2	0-10-0	0-8-3	0-7-0	0-6-7	0-6-1	0-6-6	0-6-2

N. B.—Prime costs do not include rent and overhead charges.

R. B.

Agricultural Fittings

BY THE DEPARTMENT OF AGRICULTURE, MADRAS

Agricultural Marketing. The marketing section has been engaged in the survey of many agricultural commodities of importance. Marketing survey reports of the following commodities have been completed and forwarded to the Agricultural Marketing Adviser to the Government of India :

Rice	Coffee	Eggs
Wheat	Tobacco	Hides and skins
Groundnut	Cattle	Plantains
Linseed	Milk	Grapes
		Pineapples.

The reports contain relevant information on all points relating to marketing of the commodities such as supply, demand, prices, preparation for market, assembling, transport and distribution of profits among several agencies of the trade etc. Such reports from all the Provinces and Indian States will be compiled and published by the Agricultural Marketing Adviser to the Government of India.

As a next step in the work of the marketing section, developmental activities on some of the crops for which surveys have been completed have just been taken on hand. A conference of growers, manufacturers and exporters of cigarette tobacco was held at Guntur with a view to arrive at the greatest common measure of agreement among all interests concerned in the export trade of cigarette tobacco. The district of Guntur occupies a prominent place in the cultivation of Virginia tobacco growing as it does about 40,000 acres which is more than 95% of the total area in India. Besides, it grows a considerable area ranging from 50,000 to 60,000 acres under country brown tobacco suitable for cheap cigarettes, beedies, and pipe and shag. On the unanimous agreement of all interests present at the Conference, it was resolved to form an association at Guntur to standardise grades and packages for export, and thereby improve the reputation of Indian tobacco abroad. The rules and regulations have been framed for this association, somewhat on the lines of the East India Cotton Association. The object of the association is essentially to bring more money into the pockets of the primary producer.

The preliminary requisite for any programme of organised sale of ryots' produce has to come largely from the growers. For this purpose, the creation of healthy organisations of producers is a first step. Further more, success is more possible of achievement with special purpose organisations for each commodity as tobacco, fruits etc. In order to achieve this object, the marketing section has been investigating the possibilities of such work in the primary producing areas as Cuddapah district for oranges and melons, Vizagapatam district for mangoes and Trichinopoly and Madura districts for plantains. In a recent Government Order the Government have also provided for the creation of a post of Assistant Marketing Officer, specially to help in the developmental activities of marketing work from January 1937. A Provincial Marketing Society has also been formed in Madras with a view to co-ordinate the work of several loan and sale societies, and to find a market for surplus produce like fruits, jaggery, ghee, potatoes etc., in the Madras City.

Proposals were made by the marketing section even at the beginning for the publication of prices of the commercial crops in a form useful to the trade. It was suggested that, for such information to be useful, it was necessary that wholesale prices of crops with specification of quality and trade name, ought to be published for all important markets for such commodities as paddy, rice, tobacco, jaggery etc. In a recent Government Order, the Government have ordered that from January 1937 these prices would be published each Tuesday in the Fort St. George Gazette and English and Vernacular papers issuing from Madras. The prices reported will be the wholesale prices ruling in different market centres of the presidency on Monday each week, of the several commodities. The prices will be published in terms of one common unit, viz., the Imperial maund of 82-2/7 lbs. The retail prices of the several commodities at the important market centres will also be published. The agency for such work will be the statistical section formerly attached to the Board of Revenue, and now under the Director of Industries.

It is not possible to render into the small space available in our dailies the extensive data collected by the marketing staff, but it is proposed periodically to give short marketing notes on important commodities like rice, groundnut, coconut, coffee, fruits, milk etc., in the succeeding issues for the benefit of the public.

Crop & Trade Reports.

Paddy—1936-37—Intermediate Report. The main crop of paddy has been or is being harvested in parts of the Circars, Kurnool, Nellore, Coimbatore, Madura and the West Coast. The yield is reported to be normal in Vizagapatam, Kurnool, Coimbatore, Madura and the West Coast and below normal in the other districts.

In parts of the Chingleput district, the crop has been affected by drought to some extent, while in parts of the Salem district, the crop is reported to have suffered a little from attack by insects. The condition of the crop is reported to be generally satisfactory in the other important paddy growing districts.

The wholesale price of paddy per imperial maund of 82-2/7 lbs. as reported from important markets towards the close of December 1936 was Rs. 2-13-0 in Cuddapah, Rs. 2-11-0 in Nellore and Salem, Rs. 2-8-0 in Vizianagaram, Nandyal and Madura, Rs. 2-6-0 in Vellore and Erode, Rs. 2-4-0 in Guntur, Rs. 2-3-0 in Rajahmundry, Ellore, Bezwada and Masulipatam, Rs. 2-1-0 in Cocanada and Trichinopoly and Rs. 1-13-0 in Kumbakonam. As compared with the prices reported for November 1936 the prices are stationary in Rajahmundry, Cuddapah, Vellore, Salem, Erode and Kumbakonam while they reveal a fall of 11 per cent. in Madura, 7 per cent. in Vizianagaram, 4 per cent. in Trichinopoly, 3 per cent. in Guntur and 1 per cent. in Cocanada, Ellore and Bezwada and a rise of 6 per cent. in Nandyal and 2 per cent. in Nellore.

Cotton 1936-37—Intermediate forecast—Report. The Cocanadas cotton in parts of the Guntur district has recovered from the effects of the cyclone on the 28th October 1936 and is now in buds and flowers. The condition of the crop is also fairly satisfactory in the other important cotton growing districts.

The wholesale price of cotton lint per imperial maund of 82 2/7 lbs. as reported from important markets towards the close of December 1936 was Rs. 19-12-0 for Cocanadas, Rs. 25-11-0 for Red Northerns, Rs. 19-0-0 for early crop Westerns, Rs. 25-12-0 for Cambodia, Rs. 24-11-0 for Coimbatore Karunganni, Rs. 21-13-0 for Tinnevely Karunganni, Rs. 21-4-0 for Tinnevelies and Rs. 21-13-0 for Nadam Cotton. As compared with the prices in the previous month, the prices reveal a rise of about two per cent in the case of Westerns, Cambodia, Coimbatore Karunganni and Nadam and a fall of about 2 per cent in the case of Tinnevely Karunganni and Tinnevelies while the prices of Cocanadas and Red-Northerns are stationary.

Groundnut—1936—Fourth or final report. The average of the areas under groundnut in the Madras Presidency during the five years ending 1934-35 has represented 45.4 per cent of the total area under groundnut in India.

The area sown with groundnut in the Presidency in 1936 is estimated at 3,426,500 acres. When compared with the corresponding estimate of 2,480,500 acres for the previous year and the actual area of 2,519,965 acres according to the Season and Crop report of the previous year, the present estimate reveals an increase of about 38 per cent and 35 per cent respectively. The estimated area for this year exceeds the average area of 3,268,550 acres by 4.8 per cent. The area reported in respect of Vizagapatam, West Godavari, Kistna and Malabar districts are highest on record.

The increase in area is general outside Tinnevely and is marked in the Deccan (+476,900 acres).

The harvesting of the summer and early crop of groundnut had concluded by the end of October. The harvesting of the winter or main crop is proceeding.

The crop is expected to be above normal in Kistna (125 per cent), normal in Vizagapatam, East Godavari, Chittoor, Coimbatore, Ramnad and Tinnevely and below normal in the other districts notably in Trichinopoly, where it was affected by drought and caterpillar attack and the seasonal factor was reduced in consequence to only 75 per cent of the normal which is about the lowest reported in recent years. The seasonal factor for the presidency works out to 94 per cent of the average as against 95 per cent in the previous year according to the Season and Crop report. On this basis, the yield is expected to be 1,652,200 tons of unshelled nuts as against 1,201,860 tons in the previous year, an increase of 37.5 per cent. The yield in an average year is estimated at 1,616,390 tons.

The wholesale price of groundnut shelled per Imperial maund of 82-2/7 lbs. as reported from important markets towards the close of December 1936 was Rs. 6-5-0 in Cuddalore, Rs. 6-1-0 in Cocanada, Rs. 6-0-0 in Vizagapatam, Rs. 5-14-0 in Negapatam, Rs. 5-10-0 in Cuddapah, Rs. 5-9-0 in Guntur, Rs. 5-8-0 in Vizianagaram and Nandyal, Rs. 5-7-0 in Vellore, Rs. 5-6-0 in Bellary, Rs. 5-3-0 in Salem and Rs. 4-3-0 in Tinnevely. As compared with the prices for October 1936, these prices reveal a rise of 21 per cent in Nandyal, 15 per cent in Cuddapah, 10 per cent in Vizagapatam and Vellore, 6 per cent in Cuddalore, Salem and Negapatam and 5 per cent in Vizianagaram and a fall of 3 per cent in Cocanada whilst they remained stationary in Guntur and Tinnevely.

Crop—Gingelly—1936-37—Third Report. The average of the areas under gingelly in the Madras Presidency during the five years ending 1934-35 has represented 11.6 per cent. of the total area under gingelly in India.

The area sown with gingelly up to the 25th December 1936 is estimated at 511,900 acres. When compared with the area of 449,100 acres estimated for the corresponding period of last year, it reveals an increase of about 14 per cent.

The increase in area is general outside West Godavari, Kistna, Kurnool, Nellore, Trichinopoly, the South (except Tanjore) and South Kanara. The increase is marked in Vizagapatam (+37,000 acres) and Chingleput (+11,400 acres).

The main crop has been harvested except in the south where the harvest is in progress. The crop suffered from drought to some extent and the yield is reported to be below normal except in Kistna, Guntur, Kurnool, Cuddapah, Nellore, Tanjore, Ramnad, Tinnevely and South Kanara.

The seasonal factor for the Presidency works out to 91 per cent. of the average as against 92 per cent. for the corresponding period of last year. On this basis, the yield is estimated at 62,800 tons as against 55,900 tons for the corresponding period of last year, an increase of about 12.3 per cent.

1937—Ginger crop—Final Report. The area under ginger in 1936 is estimated at 10,000 acres in Malabar as against the actual area of 9,913 acres in the previous year.

The yield is estimated to be normal as against 80 per cent. of the normal in the previous year. On this basis, the total yield is expected to be 3,580 tons of dry ginger as against 3,370 tons in the previous year.

1936—Pepper crop—Final Report. The area under pepper in 1936 in the districts of Malabar and South Kanara is estimated at 94,000 acres in Malabar and 8,500 acres in South Kanara as against the final area of 89,453 acres in Malabar and 8,528 acres in South Kanara in the previous year.

The condition of the crop is generally fair. The early outbreak of the South-west monsoon affected the flushing of the crop to some extent and there was shedding as usual. The seasonal factor is estimated at 90 per cent. of the average in Malabar and 95 per cent. in South Kanara as against 90 per cent. in

each district in the previous year. On this basis, the yield is estimated at 12,700 tons for Malabar and 1,210 tons for South Kanara as against 12,200 tons for Malabar and 1,150 tons for South Kanara estimated in the previous year.

The wholesale price of pepper per imperial mound of 82-2/7 lb. as reported from important markets towards the beginning of January 1937 was Rs. 16-10-0 in Calicut, Rs. 17-7-0 in Tellicherry and Rs. 18-3-0 in Mangalore. As compared with the prices in August 1936, these prices have risen by about 33 per cent. in Calicut, 49 per cent. in Tellicherry and 38 per cent. in Mangalore.

Weather Review (DECEMBER 1936.)

RAINFALL DATA

Division	Station	Actual for month	Departure from normal @	Total since January 1st	Division	Station	Actual for month	Departure from normal @	Total since January 1st
Circars	Gopalpore	0.0	-0.7	80.3	South	Negapatam	7.9	-3.5	40.8
	Berhampore*	0.0	0.0	58.3		Aduthurai*	8.4	-0.7	41.5
	Calingapatam	1.4	0.7	46.7		Madura	1.4	-0.4	29.9
	Vizagapatam	2.8	2.1	39.7		Pamban	9.7	2.2	38.1
	Anakapalli*	0.0	0.0	...		Koilpatti*	2.1	-0.6	24.6
	Samalkota*	0.0	0.0	...		Palamkottah	2.2	-1.8	29.1
	Maruteru*	0.0	-0.6	55.4	West Coast	Trivandrum	2.6	0.2	72.9
	Cocanada	1.3	0.4	69.3		Cochin	0.4	-1.3	115.5
	Masulipatam	0.0	-0.9	47.4		Calicut	0.7	-0.4	135.7
Ceded Dists.	Guntur*	0.0	-0.1	46.8		Pattambi*	0.0	0.0	...
	Kurnool	0.1	-0.1	16.9		Taliparamba*	0.1	-0.9	130.8
	Nandyal	0.0	-1.2	23.3		Kasargode*	0.2	-0.9	155.2
	Hagari*	0.0	-0.4	24.6		Nileshwar*	0.0	-0.8	138.3
	Bellary	0.0	-0.1	17.7		Mangalore	1.0	0.5	163.0
	Anantapur	0.0	-0.3	17.4	Mysore and Coorg	Chitaldrug	0.2	-0.3	20.1
	Rentachintala	0.0	...	24.4		Bangalore	0.1	-0.4	30.3
	Cuddapah	0.0	-0.9	21.1		Mysore	0.0	-0.3	36.7
Carnatic	Anantharajupet*	2.1	...	...		Mercara	0.0	-0.7	151.1
	Nellore	0.6	-2.6	70.1	Hills.	Kodaikanal	4.4	0.0	74.8
	Madras	2.0	-3.8	44.3		Coonoor*	4.0	...	73.3
	Palur*	4.6	-3.4	48.3		Ootacamund*	0.6	-2.3	55.3
	Tindivanam*	1.6	-3.3	31.2		Nanjanad*	0.5	-1.4	52.7
	Cuddalore	5.0	-2.2	47.5					
Central	Vellore	0.5	-2.2	33.6					
	Salem	1.0	-0.0	32.6					
	Coimbatore	0.2	-1.0	21.5					
	Coimbatore Res. Inst.*	0.3	-2.0	20.3					
	Trichinopoly	1.5	-1.1	31.6					

* Meteorological Stations of the Madras Agricultural Department.

@ From average rainfall for the month calculated upto 1935 (published in Fort St. George Gazette).

During the month eight western disturbances affected the weather over North West India. Some of them in their passage caused fairly wide spread rain in the Punjab, Kashmir, North West Frontier Province, Baluchistan, Sind and United Provinces.

Conditions became unsettled in the Bay of Bengal in the neighbourhood of the Andamans on the 1st. On the 3rd they extended into the East Central Bay and concentrated into a depression west of Andamans. Moving westwards the depression weakened into a trough of low pressure standing from the South to Central Bay of Bengal on 4th, 5th and 6th and became unimportant by about the 8th. In association with this seasonal trough of low pressure in the Bay of Bengal a few falls of rain occurred intermittently in Assam, South and South East Madras, North Madras coast and Malabar during the first half of the month. Local rains were also reported from South and South East Madras on 10th, 11th and 12th.

During the second half of the month with the strengthening of the North-East Monsoon in the south west Bay of Bengal and South East Arabian Sea, local rain fell in south east Madras on the 16th and 17th. Thunder storms have also caused general rain in the United Provinces, Central Provinces, Assam, Bihar, Orissa, Hyderabad, South and South East Madras, North Madras coast and at a few stations in Malabar.

The month's rainfall was in large defect in South East Madras and slight to moderate defect in other parts of the Madras Presidency and Mysore.

Weather Report for the Research Institute Observatory :—

Report No. 12/36.

Absolute Maximum in shade	...	...	88.2° F.
Absolute Minimum in shade	...	...	59.6° F.
Mean Maximum in shade	...	...	84.6° F.
Departure from normal	...	...	-0.3° F.
Mean Minimum in shade	...	...	66.8
Departure from normal	...	...	+1.0° F.
Total rainfall	...	...	0.33
Departure from normal	...	...	-2.0"
Heaviest fall in 24 hours	...	...	0.30"
Total number of rainy days	...	...	1 day.
Mean daily wind velocity	...	...	1.5 M.P.H.
Mean humidity at 8 hours	...	...	76.0 %
Departure from normal	...	...	-3.7 %

Summary. Rainfall was in large defect. Mean Maximum temperature was below normal by 0.3° and the mean minimum above normal by 1.0°.

College News & Notes.

It is pleasing to note that M.R.Ry. Rao Bahadur T. S. Venkataraman Avl., Government Sugarcane Expert and one of our former Editors has been awarded the title of C. I. E. in the New Year Honours.

It is learnt that Mr. K. Ramiah, Paddy Specialist, and also a former Editor will be leaving the Agricultural Research Institute shortly to take up the post of Geneticist and Botanist at the Institute of Plant Industry, Indore.

The Annual Meeting of the Association of Economic Biologists was held on the 1st February 1937 and the following new office bearers were elected.

President :	Mr. K. Krishnamoorthi Rao.
Vice-President (Resident) :	Dr. J. S. Patel.
Secretary :	Mr. M. C. Cherian.

Mr. V. Ramanatha Ayyar, the retiring President, delivered his address on "The Herbaceous Cottons in India."

Departmental Notifications.

Transfers and Postings. Mr. P. K. Parameswara Menon, A. D., Namakkal to be D. A. S., Coimbatore; Mr. D. S. Subramania Iyer, A. D., Rasipuram to be in additional charge of Namakkal; Mr. M. Narayana Iyer, A. D., Jammalmadugu to IV Circle; Mr. S. Venkataramanappa Officiating A. D., IV circle to Dry Farming Station Hagari; Mr. P. K. Natesa Iyer, A. D., Manamadura to Agricultural College as Assistant Lecturer in Agriculture; Mr. M. Bhavani Shanker Rao, A. R. S., Tindivanam to Coimbatore. Mr. V. V. Rajagopalan, A. R. S., Kasargode to A. R. S., Tindivanam.

Leave. Mr. A. Chidambaram Pillai, A. D., Van Duty, l. a. p. for four months from 1—2—37; Mr. I. Kumara Rao, A. R. S., Anakapalle. l. a. p. on medical certificate for two months from 4—1—37 with permission to prefix Xmas and New Year holidays; Mr. V. Suryanarayana, Assistant Lecturer in Agriculture, l. a. p. for eight days from 25—1—37 with permission to prefix the Penultimate Saturday the 23rd and Sunday the 24th January and on half average pay for 1 month and 19 days in continuation thereof with permission to suffix the Mohurram and Easter holidays; Mr. M. Subramaniam Pillai, D. A. S., Coimbatore. l. a. p., for one month from the date of relief Mr. P. Kannappa Pillai, VII circle extension of l. a. p. on m. c. for 1 month and 12 days. Mr. T. Rangabrahma Rao, A. R. S., Anakapalle, l. a. p. for two months on m. c. from 21—1—37. Mr. A. P. Balakrishna Nayar, l. a. p. on m. c. for two months from 28—1—37.

ADDITIONS TO THE LIBRARY, DECEMBER 1936

A. Books.

1. Pedology. *Joffe, J. S.* (1936). 2. Farm Machinery—Text and Handbook. *Cook, G. C. etc.* (1936). 3. Mixed Farming in East Africa. *Morrison, O. R.* (1935). 4. Tobacco Diseases and Decoys. *Wolf, F. A.* (1935). 5. The Garden Encyclopaedia. *Seymour, E. L. D.* (1936). 6. Horticulture (Vocation Agri. Ser.). *Stuckey, H. P. & Mathews, C. D.* (1935). 7. Diseases of Vegetable Crops. *Walker, J. C.* (1936). 8. A Digest of Pasture Research Literature in U. S. A. and Canada (1885—1935). *Pieters, A. J.* (1936). 9. Selecting, Fitting and Showing Dairy Cattle. *Lattig, H. L. & Nordby, J. E.* (1935). 10. Practical Dairy Tests and Fundamentals of Dairying. *Burke, A. D.* (1935). 11. Elements of Livestock Judging. *Smith, A. A.* (1930). 12. Dairy Industry and the U. S. A. (Agri. Adjustment Act). *Black, J. D.* (1935). 13. Feeds and Feeding (20th Edn. Rev.). *Morrison, F. B.* (1936). 14. Growth Hormones in Plants. *Jensen, F. B.* (1936). 15. Evolution and Heredity. Theories and Problems. *Felker, S. M.* (1936).

B. Reports.

1. Report on the operations of the Madras Agri. Dep. for 1935—1936 2. Report of the Madras Industries Department for 1936. 3. Annual Report of the Rice Res. Stn. Berhampur (Madras) for 1934—1935. 4. Annual Report of the Rice Res. Schemes at Bankura and Chinsura (Bengal) for 1934—1935. 5. Annual Report of Rice Res. Stn., Sabour (Bihar and Orissa), 1934—35. 6. Annual Report of Rice Res. Officer, Burma for 1935. 7. Annual Report of the Rice Res. Stn., Nagina (U. P.) for 1934—1935. 8. Punjab Season and Crop Reports for 1936. 9. Report on the Operations of the Burma Agri. Dep. for 1936. 10. Report of Agri. Stations, Burma for 1936. 11. Burma Season and Crop Report for 1936. 12. Reading

National Inst. for Dairying Annual Report for 1935. 13. St. Lucia Agri. Dep. Annual Report for 1935. 14. Research Abstract Report of Agri. Dep. St. Lucia for 1935.

C. Special Publications.

15. Recent Improvements in the Simple Clarification for New Sugar Production. 16. Proceedings of the 3rd Annual Citrus Institute sponsored by Edinburgh College, 1934. 17. Massachusetts Horticultural Society Year Book, 1936. 18. Agriculture: Outlines of Instruction for Educational Advisers and Instructors in Civilian Conservation Corps. 19. American Experiments to find the most suitable method of Applying Artificial Fertilisers for various crops.

D. Bulletins, Memoirs Etc.

20. Diseases of Sugarcane and Methods for their Control. *I. C. A. R. Mis. Bul. 10*. 21. Cultivation and Curing of Cigarette Tobaccos (Nicotians Tobaccum). *U. S. Agri. Dep. Bul. 71*. 22. Commercial Flower Production, Part I. *Eng. Min. Bul. 96*. 23. Fruit: A Summary of Figures of Production and Trade relating to Apples etc. *Eng. I. A. C. Pubn.* 24. Use of Irrigation water on Farm Crops. *Canada Agri. Pubn. 509*. 25. Pneumatic Equipment for Farm Tractors. *Rubber Growers' Assn. Bull. 1*. 26. Pneumatic Equipment for Horse Drawn Vehicles. 27. Rubber for Roadless Tractors and Trailers. 28. The Care and Cleaning of Milking Machines. *Ibid. Bull. Nos. 2, 3, 4*. 29. On the Biology of Red Scale. *Palest. Agri. Exp. Stn. Bulletin No. 15*. 30. Influence of Fixtures on Stomatal Behaviour: Critical Remarks on the value of Lloyd's alcohol fixation method for measuring stomatal aperture. 31. The Florida Wax-scale. 32. On citrus Fertilization with special reference to seedliness and seedlessness of the Jaffa Orange. 33. Phytophthora Stem and Tip Blight of Citrus Seedlings. *Ibid. Bull. Nos. 16, 17, 18, 20*. 34. Milk Production Costs in West Virginia I. A Study of the Costs incurred by 51 Farms in the Morgantown and Fairmont Markets in 1934-1935. *W. Virgin. A. E. S. Bull. 268*. 35. Grape Growing in Colorado. *Colorado A. E. S. Bull.* 36. Cover Crops for Soil Conservation. *U. S. Farm Bul. 1758*. 37. Incomplete Milking in relation to Milk Production and Udder Troubles in Dairy cows. *U. S. Tech. Bull. 522*. 38. Statistics of Farmers' Co-operative Business Organisations 1930-1935. *Wash. Farm Credit Admn. Bull. 6*. 39. Homemade Centrifugal Pump and other water-lifting devices. *Montana A. E. S. Bull. 324*. 40. Packing Minnesota Fruits for Market. *Minn. A. E. S. Bul. 323*. 41. Karyologische and Genetische Studien etc. *Ryoto Col. Mem. Gen. Ser. No. 38*.

E. Circulars, Leaflets Etc.

42. Leaf Curl Disease of Chillies. *Madras Agri. Dep. Leaf. 73*. 43. The Grading of Eggs according to the Canadian standards. *Canada Agri. Dep. Pubn. 504*. 44. Studies in Fruit Disease. IA. Apple Scab. *Ibid. Pubn. 519*. 45. Blue Grama Grass for Erosion control and Range Reseeding in the Great Plains and a Method of Obtaining Seed in Large Lots. *U. S. Agri. Dep. Cir. 402*. 46. Grace Growing in Kansa. *Kansas Agri. Exp. Stn. Cir. 177*. 47. Poultry Management. *Ibid. Cir. 178*. 48. Plant Forcing with Electric Lights. *Indian A. E. S. Cir. 206*.